Water Quality Assessment
the Arkansas River
Holcim (US) Inc. Portland Plant and Its WWTF

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I. Water Quality Assessment Summary

Table A-1 includes summary information related to this WQA. This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and 305(b) listings; low flow and facility flow summaries; and a list of parameters evaluated.

Table A-1
WQA Summary

Facility Information			
Facility Name	**Permit Number**	**Design Flow (max 30-day ave, MGD)**	**Design Flow (max 30-day ave, CFS)**
Portland Plant WWTF	CO0000671	Outfalls 002A: 0.2 007A: 0.7 0.9 (combined flow of 002A and 007A) Outfall 003A: 0.15	0.3 1.1 1.4 0.23

Receiving Stream Information			
Receiving Stream Name	**Segment ID**	**Designation**	**Classification(s)**
the Arkansas River	COARUA03	Undesignated	Aquatic Life Cold 1, Recreation Class E, Agriculture, Water Supply

Low Flows (cfs)			
1E3 (1-day)	**7E3 (7-day)**	**30E3 (30-day)**	**Ratio of 30E3 to the Design Flow (cfs)**
107	124	144	626:1, 003A (WWTF) 103:1, 002Aand 007A (combined)

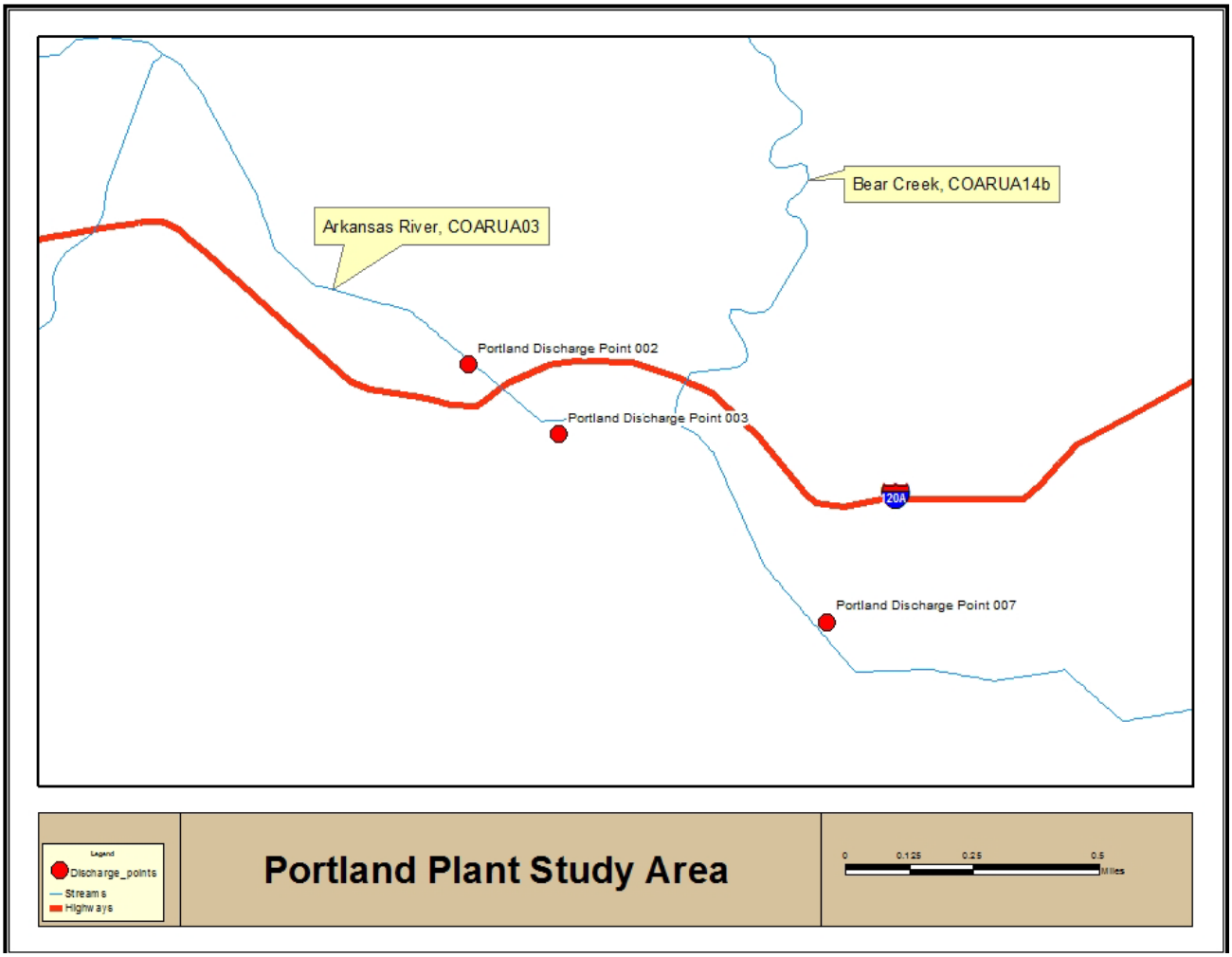
Regulatory Information					
T&E Species	**303(d) (Reg 93)**	**Monitor and Eval (Reg 93)**	**Existing TMDL**	**Temporary Modification(s)**	**Control Regulation**
No	None	None	Yes, Approved on 6/14/2009 for Zn and Cd	For Stream Segment COARUA03 Temporary modifications: Type (iii) Cd(ch)=0.48 Expiration date of 12/31/13	None

Pollutants Evaluated
Ammonia, *E. coli*, TRC, Metals, Temp for the outfalls discharging WWTF effluent TRC, Metals, Temp, SAR, EC for the outfalls discharging stormwater/groundwater effluent

II. Introduction

The water quality assessment (WQA) of the Arkansas River and Bear Creek near the Portland Plant wastewater treatment facility (WWTF), water treatment plant (WTP) and Stormwater/Groundwater outfalls, located in Fremont County, is intended to determine the assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other requirements as discussed in the permit rationale. Figure A-1 contains a map of the study area evaluated as part of this WQA.

FIGURE A-1



The Portland Plant WWTF discharges to the Arkansas River, which is stream segment COARUA03. This means the Arkansas River Basin, Upper Arkansas Sub-basin, Stream Segment 03. This segment is composed of the "Mainstem of the Arkansas River from a point immediately above the confluence with the Lake Creek to the inlet to Pueblo Reservoir.". Stream segment COARUA03 is classified for Aquatic Life Cold 1, Recreation Class E, Water Supply and Agriculture. Note that the facility also discharges WTP and stormwater/groundwater combinations.

Information used in this assessment includes data gathered from the Portland Plant WWTF, the Division, the U.S. Geological Survey (USGS), and communications with the local water commissioner. The data used in the assessment consist of the best information available at the time of preparation of this WQA analysis.

III. Water Quality Standards

Narrative Standards

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters

of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

(i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or (v) produce a predominance of undesirable aquatic life; or (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

(i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in CDPS discharge permits.

Standards for Organic Parameters and Radionuclides

Radionuclides: Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.

In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

Table A-2
Radionuclide Standards

Parameter	Picocuries per Liter
Americium 241*	0.15
Cesium 134	80
Plutonium 239, and 240*	0.15
Radium 226 and 228*	5
Strontium 90*	8
Thorium 230 and 232*	60
Tritium	20,000

*Radionuclide samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values for both plutonium and americium.

Organics: The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as "interim standards" and will remain in effect until alternative permanent standards are adopted by the Commission. These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards for organics apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where the Water Quality Control Commission has made such determination.

Because the the Arkansas River is classified for Aquatic Life Cold 1, with a water supply designation, the water supply, water + fish, and aquatic life standards apply to this discharge.

Salinity

Salinity: The Division's policy, Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, may be applied to discharges where an agricultural water intake exists downstream of a discharge point. Limitations for electrical conductivity and sodium absorption ratio may be applied in accordance with this policy.

Temperature: Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

Effective until December 31, 2012: Segments or portions of segments that are first, second or third order streams above 7000 feet elevation and classified Aquatic Life cold 1 or 2 shall have a chronic temperature standard of 17°C (MWAT) with no acute standard. Other cold class 1 or 2 segments or portions of segments shall have a chronic temperature standard of 20°C (MWAT) with no acute standard. Segments that are classified Aquatic Life warm 1 or 2 shall have a chronic temperature standard of 30°C (MWAT) with no acute standard.

Segment Specific Numeric Standards

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Water Quality Control Commission. The standards in Table A-3 have been

assigned to stream segments COARUA03, in accordance with the *Classifications and Numeric Standards for Arkansas River Basin*.

Table A-3 **In-stream Standards for Stream Segment COARUA03**
Physical and Biological
Dissolved Oxygen (DO) = 6 mg/l, minimum (7 mg/l, minimum during spawning)
pH = 6.5 - 9 su
E. coli chronic = 126 colonies/100 ml
Temperature chronic (MWAT) = 20 ° C
Inorganic
Total Ammonia acute and chronic = TVS
Chlorine acute = 0.019 mg/l
Chlorine chronic = 0.011 mg/l
Free Cyanide acute = 0.005 mg/l
Sulfide chronic = 0.002 mg/l
Boron chronic = 0.75 mg/l
Nitrite acute = 0.05 mg/l
Nitrate acute = 10 mg/l
Chloride chronic = 250 mg/l
Sulfate chronic = For WS, the greater of ambient water quality as of January 1, 2000 or 250 mg/l
Metals
Dissolved Arsenic acute = 340 µg/l
Total Recoverable Arsenic chronic = 0.02 µg/l
Dissolved Cadmium acute for trout and Dissolved Cadmium chronic = TVS Temporary modifications: Type (iii) Cd(ch)=0.48 Expiration date of 12/31/13.
Total Recoverable Trivalent Chromium acute = 50 µg/l
Dissolved Hexavalent Chromium acute and chronic = TVS
Dissolved Copper acute and chronic = TVS
Dissolved Iron chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 300 µg/l
Total Recoverable Iron chronic = 1000 µg/l
Dissolved Lead acute and chronic = TVS
Dissolved Manganese chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 50 µg/l
Dissolved Manganese acute and chronic = TVS
Total Mercury chronic = 0.01 µg/l
Dissolved Nickel acute and chronic = TVS
Dissolved Selenium acute and chronic = TVS
Dissolved Silver acute and Dissolved Silver chronic for trout = TVS
Dissolved Zinc acute and chronic = TVS

Table Value Standards and Hardness Calculations

Standards for metals are generally shown in the regulations as Table Value Standards (TVS), and these often must be derived from equations that depend on the receiving stream hardness or species of fish present; for ammonia, standards are discussed further in Section IV of this WQA. The Classification and Numeric Standards documents for each basin include a specification for appropriate hardness values to be used. Specifically, the regulations state that:

> The hardness values used in calculating the appropriate metal standard should be based on the lower 95% confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used.

Hardness data for the Arkansas River near the point of discharge of the Portland Plant WWTF were insufficient to conduct a regression analysis based on the low flow. Therefore, the Division's alternative approach to calculating hardness was used, which involves computing a mean hardness.

The mean hardness was computed to be 163 mg/l based on sampling data from USGS Gage Station 07099200 (Arkansas River near Portland, CO) located on the Arkansas River, downstream from the Portland Plant. This hardness value and the formulas contained in the TVS were used to calculate the in-stream water quality standards for metals, with the results shown in Table A-4.

Table A-4

TVS-Based Metals Water Quality Standards for COARUA03

Based on the Table Value Standards Contained in the Colorado Department of Public Health and Environment Water Quality Control Commission *Regulation 32*

Parameter	***In-Stream Water Quality Standard***			***TVS Formula: Hardness (mg/l) as CaCO3 =*** **163**
Cadmium, Dissolved	Acute	2.6	µg/l	$[1.136672-0.041838\ln(\text{hardness})]e^{(0.9151(\ln(\text{hardness}))-3.6236)}$
	Chronic	0.61	µg/l	$[1.101672-0.041838\ln(\text{hardness})]e^{(0.7998(\ln(\text{hardness}))-4.4451)}$
Hexavalent Chromium, Dissolved	Acute	16	µg/l	Numeric standards provided, formula not applicable
	Chronic	11	µg/l	Numeric standards provided, formula not applicable
Copper, Dissolved	Acute	21	µg/l	$e^{(0.9422(\ln(\text{hardness}))-1.7408)}$
	Chronic	14	µg/l	$e^{(0.8545(\ln(\text{hardness}))-1.7428)}$
Lead, Dissolved	Acute	109	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-1.46)}]$
	Chronic	4.3	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-4.705)}]$
Manganese, Dissolved	Acute	3513	µg/l	$e^{(0.3331(\ln(\text{hardness}))+6.4676)}$
	Chronic	1941	µg/l	$e^{(0.3331(\ln(\text{hardness}))+5.8743)}$
Nickel, Dissolved	Acute	708	µg/l	$e^{(0.846(\ln(\text{hardness}))+2.253)}$
	Chronic	79	µg/l	$e^{(0.846(\ln(\text{hardness}))+0.0554)}$
Selenium, Dissolved	Acute	18.4	µg/l	Numeric standards provided, formula not applicable
	Chronic	4.6	µg/l	Numeric standards provided, formula not applicable
Silver, Dissolved	Acute	4.7	µg/l	$½\ e^{(1.72(\ln(\text{hardness}))-6.52)}$
	Chronic	0.17	µg/l	$e^{(1.72(\ln(\text{hardness}))-10.51)}$
	Chronic	0.74	µg/l	$e^{(1.72(\ln(\text{hardness}))-9.06)}$
Zinc, Dissolved	Acute	217	µg/l	$0.978e^{(0.8525(\ln(\text{hardness}))+1.0617)}$
	Chronic	189	µg/l	$0.986\ e^{(0.8525(\ln(\text{hardness}))+0.9109)}$

Total Maximum Daily Loads and Regulation 93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List

The stream segment COARLA03, Upper Arkansas, has an issued TMDL for cadmium and zinc. Note that the TMDL does not name the facility for any waste load allocations at this time. The Division did however look at the effluent concentrations of those pollutants and concluded that cadmium with an effluent concentration of zero is not a pollutant of concern for this facility. The effluent has low levels of zinc and therefore, the Division included zinc in the permit limitation table as 'report only' to collect data and confirm low levels of zinc in the effluent. If a TMDL waste load allocation is ever established for this discharge, it would be included in potential future effluent limits for the facility.

IV. Receiving Stream Information

Low Flow Analysis

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

To determine the low flows available to the Portland Plant, USGS gage station 07097000 (Arkansas River at Portland, CO) was used for its discharge to COARUA03. This flow gage provides a representative measurement of upstream flow even though it is located immediately downstream from the outfalls 002A and 004A (stormwater outfall covered under a stormwater permit). Note that those outfalls do not have continuous discharge and the discharge is significantly smaller than the low flow and therefore no significant impact from the outfalls is expected on the low flow.

Daily flows from the USGS Gage Station 07097000 (Arkansas River at Portland, CO) were obtained and the annual 1E3, 7E3 and 30E3 low flows were calculated using U.S. Environmental Protection Agency (EPA) DFLOW software. The output from DFLOW provides calculated acute and chronic low flows for each month.

Flow data from September 30, 2000 through September 30, 2011 were available from the gage station. The gage station and time frames were deemed the most accurate and representative of current flows and were therefore used in this analysis.

Based on the low flow analysis described previously, the upstream low flows available to the Portland Plant WWTF were calculated and are presented in Table A-5.

Table A-5

Low Flows for the Arkansas River at the Portland Plant WWTF

Low Flow (cfs)	*Annual*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
1E3 Acute	107	166	151	183	128	140	177	118	114	107	119	165	169
7E3 Chronic	124	176	171	188	145	150	177	124	127	124	127	165	198
30E3 Chronic	144	182	182	189	172	172	177	144	144	144	144	165	201

During the months of June and November, the acute low flow calculated by DFLOW exceeded the chronic low flow. In accordance with Division standard procedures, the acute low flow was thus set equal to the chronic low flow for these months.

The ratio of the low flow of the Arkansas River to the Portland Plant WWTF design flow is 626:1. The ratio for outfalls 002A and 007A is 103:1.

Mixing Zones

The amount of the available assimilative capacity (dilution) that may be used by the permittee for the purposes of calculating the WQBELs may be limited in a permitting action based upon a mixing zone analysis or other factor. These other factors that may reduce the amount of assimilative capacity available in a permit are: presence of other dischargers in the vicinity; the presence of a water diversion downstream of the discharge (in the mixing zone); the need to provide a zone of passage for aquatic life; the likelihood of bioaccumulation of toxins in fish or wildlife; habitat considerations such as fish spawning or nursery areas; the presence of threatened and endangered species; potential for human exposure through drinking water or recreation; the possibility that aquatic life will be attracted to the effluent plume; the potential for adverse effects on groundwater; and the toxicity or persistence of the substance discharged.

Unless a facility has performed a mixing zone study during the course of the previous permit, and a decision has been made regarding the amount of the assimilative capacity that can be used by the facility, the Division assumes that the full assimilative capacity can be allocated. Note that the review of mixing study considerations, exemptions and perhaps performing a new mixing study (due to changes in low flow, change in facility design flow, channel geomorphology or other reason) is evaluated in every permit and permit renewal.

If a mixing zone study has been performed and a decision regarding the amount of available assimilative capacity has been made, the Division may calculate the water quality based effluent limitations (WQBELs) based on this available capacity. In addition, the amount of assimilative capacity may be reduced by T&E implications.

For this facility, 100% of the available assimilative capacity may be used as the facility has not had to perform a mixing zone study, and the discharge is not to a T&E stream segment, and is not expected to have an influence on any of the other factors listed above.

Ambient Water Quality

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19). Ambient water quality for the Arkansas River, COARUA03, is evaluated in this WQA analysis for use in determining assimilative capacities and in completing antidegradation reviews for pollutants of concern, where applicable.

To conduct an assessment of the ambient water quality upstream of the Portland Plant facility, data were gathered from USGS Station 07097000 located immediately upstream from outfall 003A. Note that this station is downstream from the outfalls 002A, however, no significant contribution from this outfall is expected on the water quality since they are both very small as compared to the low flow and not continuous, as discussed before. Data were available for a period of record from September 2005 through September 2010, most data coming from 2009. A summary of the upstream data from this source is presented in Table A-6.

Table A-6

Ambient Water Quality for the Arkansas River

Parameter	*Number of Samples*	*15th Percentile*	*50th Percentile*	*85th Percentile*	*Mean*	*Maximum*	*Chronic Stream Standard*	*Notes*
pH (su)	12	8.3	8.7	9	8.6	9.2	6.5-9	
E. coli (#/100 ml)	4	18	30	39	25	44	126	1
Nitrate as N (mg/l)	4	0.17	0.2	0.22	0.19	0.23	10	
Nitrite as N (mg/l)	4	0.0025	0.003	0.0036	0.003	0.004	0.05	
Nitrate+Nitrite as N (mg/l)	4	0.17	0.2	0.22	0.2	0.24	NA	
NH_3 as N, Tot (mg/l)	4	0	0	0.026	0.012	0.048	TVS	2
Cd, TR (µg/l)	3	0.03	0.03	0.037	0.033	0.04	NA	
Fe, TR (µg/l)	1	3460	3460	3460	3460	3460	1000	3
Se, Dis (µg/l)	4	0.4	0.56	0.97	0.68	1.3	4.6	
U, Dis (µg/l)	4	2.1	2.9	4.9	3.4	6.4	1385	
Zn, Dis (µg/l)	4	1.1	3.4	4.5	2.9	4.6	89	
B, Tot (mg/l)	1	0.048	0.048	0.048	0.048	0.048	0.75	
Chloride (mg/l)	10	3.3	6.7	10	7	12	250	
Sulfate (mg/l)	10	35	67	110	73	134	250	
Calcium (mg/l)	10	24	39	58	42	65	NA	
Magnesium (mg/l)	10	5.4	9.6	15	10	17	NA	
Sodium (mg/l)	10	7.5	14	23	16	28	NA	
SAR	10	0.34	0.55	0.7	0.54	0.8	NA	
EC (dS/cm)	108	0.22	0.37	0.47	0.36	0.6	NA	
Hardness as $CaCO_3$ (mg/l)	10	63	88	120	93	130	NA	

Note 1: The calculated mean is the geometric mean. Note that for summarization purposes, the value of one was used where there was no detectable amount because the geometric mean cannot be calculated using a value equal to zero.

Note 2: When sample results were below detection levels, the value of zero was used in accordance with the Division's standard approach for summarization and averaging purposes.

Note 3: The ambient water quality exceeds the water quality standards for these parameters.

V. Facility Information and Pollutants Evaluated

Facility Information

The Portland Plant is located at in the NE 1/4 of S20, T19S, R68W; 3500 Hwy 120, Florence, CO; at 38° 23' 55.306" latitude North and 105° 01' 72.438" longitude West in Fremont County. The current design capacity of the domestic WWTF that treats only domestic sewage is 0.15 MGD (0.235cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity. The WWTF outfall is 003A.

This is a cement facility and also discharges stormwater/groundwater mixture (007A) as well as a mixture of wastewater and water treatment facility effluent and stormwater (002A). Therefore, the facility has a total of four outfalls, and one is an internal outfall (009A) to accommodate WWTF discharge from both outfalls 002A and 003A, as listed below:

Outfall	*Latitude, Longitude*	*Design Capacity, MGD*	*Wastewater Source*	*Receiving Water*
002A	*38° 23' 17 " N, 105° 00' 56" W*	*0.2*	*WWTP Effluent/ WTP Underflow/Backwash, normally recirculates / Stormwater (Logistics area)*	*Arkansas River*
003A	*38° 23' 13 " N, 105° 00' 47" W*	*0.15*	*WWTP Effluent, normally recirculates*	*Arkansas River*
007A	*38° 22' 55.40 " N, 105° 00' 11.65" W*	*0.7*	*Stormwater/Groundwater (Quarry, East Pit)*	*Arkansas River*
009A	*38° 23' 13 " N, 105° 00' 47.01" W*	*0.15*	*Internal Outfall for WWTF effluent to accommodate Outfalls 002A and 003A discharge, located at WWTF sump pump*	

Self monitoring samples taken in accordance with the monitoring requirements shall be obtained from permitted feature 009A (internal outfall) 38° 23' 13 " N, 105° 00' 47" W which is following disinfection and prior to mixing with the receiving stream. Note that internal output is located upstream from the connector between outfalls 002A and 003A. Note also that the location lat/long of the outfall 009A is taken as 0.01" west of the outfall 003A (WWTF facility sump pump), based on the Division staff's estimate from a site visit.

It should be noted in here that the sixth outfall (008A) included in the permit renewal application to be added to the permit, was not included based on the assessments of Division staff at a site visit and the email correspondence, dated 12/20/2010, from the Environmental Manager for the facility.

Also, during the site visit conducted on November 19, 2010, the Division staff noticed a non-permitted pond that has been collecting liquid from a wet scrubber. Note that about two or three times a year (according to a letter from the facility dated December 14, 2010) the liquid from the

scrubber is released for various reasons such as maintenance. The Division staff told the facility representatives that the discharge to the pond is not permitted and not reported and therefore, the new permit will have the pond as an additional Outfall (surface discharge since it was located in the alluvium of the Arkansas River) if no other option(s) are available. The letter sent by the facility, dated December 14, 2010, addressed an alternative option to the discharging to the pond. The alternative option will include collection of the scrubber liquid in one of the three process water tank located on north east side of the plant. Then, the liquid will be reused within the plant, mainly as a cooling medium in the area of product grinding where the solids are reintroduced into the system and ultimately integrated into the final product. Because of this recirculation process of the scrubber water, the Division did not add the pond as an outfall.

An assessment of Division records indicate that there are facilities discharging to the same stream segment or other stream segments immediately upstream or downstream from this facility. Fremont Sanitation District WWTF (CO-0039748), which discharges to the Arkansas River approximately 4 miles upstream is one of the closest. However, due to the significant dilution of the receiving stream, modeling downstream facilities in conjunction with the Portland Plant WWTF was not necessary.

It should be noted that the industrial discharge of stormwater/groundwater from this facility does not require modeling with other facilities either due to the chemistry of discharges or the large dilution potential.

Pollutants of Concern

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit rationale.

There are no site-specific in-stream water quality standards for BOD_5 or $CBOD_5$, TSS, percent removal, and oil and grease for this receiving stream. Thus, assimilative capacities were not determined for these parameters. The applicable limitations for these pollutants can be found in Regulation No. 62 and will be applied in the permit for the WWTF.

The following parameters were identified by the Division as pollutants to be evaluated for this facility (Outfall 003A):

- Total Residual Chlorine
- TSS
- BOD_5
- *E. coli*
- Nitrate
- Ammonia

Based upon the size of the discharge, dilution provided by the receiving stream and the fact that no unusually high metals concentrations are expected to be found in the domestic wastewater effluent,

metals are not evaluated further in this water quality assessment for outfall 003A. Therefore, domestic WWTF discharge only Outfall (003A) will not have metals limitations.

For the Outfall 002A which will have water treatment plant and stormwater discharge components together with the WWTF effluent will be subject to salinity parameters due to the WTP input, as shown below.

- Total Residual Chlorine
- TSS
- pH
- BOD_5
- *E. coli*
- Nitrate
- Ammonia
- Temperature
- Metals
- SAR and EC

As for the other outfalls stormwater/groundwater (007A), parameters given below will be applicable

- Temperature
- TSS
- pH
- Metals
- SAR and EC

However, since this discharge is calculated in combination with outfall 002A, all other parameters applied to outfall 002A will also be considered.

According to the *Rationale for Classifications, Standards and Designations of the Arkansas River*, stream segment COARUA03 is designated a water supply because "Canon City (PWS #122100) and Colorado Springs (PWS #121150) withdraw water from this segment." Note that Canon City is about 13 miles upstream from the facility and the intake for Colorado Springs is 18 miles downstream from the facility and seemed to be on another stream segment downstream from the Pueblo Reservoir. Thus, the nitrate standard, which is applied at the point of intake to a water supply, is not further evaluated as part of this WQA.

During assessment of the facility, nearby facilities, and receiving stream water quality, no additional parameters were identified as pollutants of concern.

VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

Technical Information

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (federal Effluent Limitations Guidelines, State Effluent Limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections II and III are used to determine the assimilative capacity of the Arkansas River near the Portland Plant WWTF for pollutants of concern, and to calculate the WQBELs. For all parameters except ammonia, it is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis. For ammonia, it is the standard procedure of the Division to determine monthly WQBELs using the monthly low flows, as the regulations allow the use of seasonal flows.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants and modeling for pollutants such as ammonia. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard. The mass-balance equation is expressed as:

$$M_2 = \frac{M_3 Q_3 - M_1 Q_1}{Q_2}$$

Where,

Q_1 = Upstream low flow (1E3 or 30E3)
Q_2 = Average daily effluent flow (design capacity)
Q_3 = Downstream flow ($Q_1 + Q_2$)
M_1 = In-stream background pollutant concentrations at the existing quality
M_2 = Calculated WQBEL
M_3 = Water Quality Standard, or other maximum allowable pollutant concentration

A more detailed discussion of the technical analysis is provided in the pages that follow.

For non-zero low flow receiving waters, the upstream background pollutant concentrations used in the mass-balance equation will vary based on the regulatory definition of existing ambient water quality. For most pollutants, existing quality is determined to be the 85th percentile. For metals in the total or total recoverable form, existing quality is determined to be the 50th percentile. For pathogens such as *E. coli*, existing quality is determined to be the geometric mean.

For temperature, the highest 7-day mean (for the chronic standard) of daily average stream temperature, over a seven consecutive day period will be used in calculations of the chronic

temperature assimilative capacity, where the daily average temperature should be calculated from a minimum of three measurements spaced equally through the day. The highest 2-hour mean (for the acute standard) of stream temperature will be used in calculations of the acute temperature assimilative capacity. The highest 2-hour mean should be calculated from a minimum of 12 measurements spaced equally through the day.

Calculation of WQBELs

Using the mass-balance equation provided in the beginning of Section VI, the acute and chronic low flows set out in Section IV, ambient water quality as discussed in Section IV, and the in-stream standards shown in Section III, the WQBELs for were calculated. The data used and the resulting WQBELs, M_2, are set forth in Table A-7a for the chronic WQBELs and A-7b for the acute WQBELs for Outfall 003A. Tables A-7c and A-7d provides chronic and acute WQBELs for outfalls 002A and 007A.

Where a WQBEL is calculated to be a negative number and interpreted to be zero, the Division standard procedure is to allocate the water quality standard to prevent further degradation of the receiving waters.

Chlorine: There are no point sources discharging total residual chlorine within one mile of the Portland Plant WWTF. Because chlorine is rapidly oxidized, in-stream levels of residual chlorine are detected only for a short distance below a source. Ambient chlorine was therefore assumed to be zero (Table A-7a and b).

***E. coli*:** There are no point sources discharging *E. coli* within one mile of the Portland Plant WWTF. Thus, WQBELs were evaluated separately. In the absence of *E. coli* ambient water quality data, fecal coliform ambient data are used as a conservative estimate of *E. coli* existing quality (Table A-7a).

Temperature: As for the Arkansas River discharges, the 7E3 low flow is 124 cfs, resulting in a dilution ratio (7E3 low flow to effluent) of 539 for Outfall 003A. The discharge is from a domestic WWTF where the available dilution ratio is > 10:1, therefore, in accordance with the Division's Temperature Policy, no temperature limitations are required for this outfall.

As for the outfalls 002A and 007A with a discharge capacity totaling 0.9 MGD (1.4 cfs), the Arkansas River provides a dilution of 103:1 which is larger than 40:1 dilution, therefore, in accordance with the Division's Temperature Policy, no temperature limitations are required for this outfall.

Nitrate / Total Inorganic Nitrogen (T.I.N.): As noted above, this parameter is not applicable and therefore, not evaluated.

Table A-7a

Chronic WQBELs for outfall 003A

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2	*Notes*
E. coli (#/100 ml)	144	0.23	144.23	30	126	***60230***	
TRC (mg/l)	144	0.23	144.23	0	0.011	***6.9***	

Table A-7b

Acute WQBELs

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2	*Notes*
TRC (mg/l)	107	0.23	107.23	0	0.019	***8.9***	

Table A-7c

Chronic WQBELs for Outfall 002A and 007A

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2	*Notes*
E. coli (#/100 ml)	144	1.4	145.4	30	126	***10000***	
TRC (mg/l)	144	1.4	145.4	0	0.011	***1.1***	
As, TR (µg/l)	144	1.4	145.4	0	0.02	***2.1***	
Cd, Dis (µg/l)	144	1.4	145.4	0	0.61	***63***	
Cr+6, Dis (µg/l)	144	1.4	145.4	0	11	***1142***	
Cu, Dis (µg/l)	144	1.4	145.4	0	14	***1454***	
Fe, Dis (µg/l)	144	1.4	145.4	0	300	***31157***	
Fe, TR (µg/l)	144	1.4	145.4	3460	1000	***1000***	1
Pb, Dis (µg/l)	144	1.4	145.4	0	4.3	***447***	
Mn, Dis (µg/l)	144	1.4	145.4	0	1610	***167210***	
Hg, Tot (µg/l)	144	1.4	145.4	0	0.01	***1***	
Ni, Dis (µg/l)	144	1.4	145.4	0	79	***8205***	
Se, Dis (µg/l)	144	1.4	145.4	0.97	4.6	***378***	
Ag, Dis (µg/l)	144	1.4	145.4	0	0.17	***18***	
Zn, Dis (µg/l)	144	1.4	145.4	4.5	89	***8780***	

Table A-7d

Acute WQBELs for Outfall 002A and 007A

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2	*Notes*
E. coli (#/100 ml)	chronic X 2 = acute					***21029***	
TRC (mg/l)	107	1.4	108.4	0	0.019	***1.5***	
Nitrate as N (mg/l)	107	1.4	108.4	0.22	10	***757***	
Nitrite as N (mg/l)	107	1.4	108.4	0.0036	0.05	***3.6***	
Cd, Dis (µg/l)	107	1.4	108.4	0	2.6	***201***	
Cr, TR (µg/l)	107	1.4	108.4	0	50	***3871***	
Cr+3, TR (µg/l)	107	1.4	108.4	0	50	***3871***	
Cr+6, Dis (µg/l)	107	1.4	108.4	0	16	***1239***	
Cu, Dis (µg/l)	107	1.4	108.4	0	21	***1626***	
CN, Free (µg/l)	107	1.4	108.4	0	5	***387***	
Pb, Dis (µg/l)	107	1.4	108.4	0	109	***8440***	
Ni, Dis (µg/l)	107	1.4	108.4	0	708	***54819***	
Se, Dis (µg/l)	107	1.4	108.4	0.97	18.4	***1351***	
Ag, Dis (µg/l)	107	1.4	108.4	0	4.7	***364***	
Zn, Dis (µg/l)	107	1.4	108.4	4.5	217	***16458***	

Ammonia: The Ammonia Toxicity Model (AMMTOX) is a software program designed to project the downstream effects of ammonia and the ammonia assimilative capacities available to each discharger based on upstream water quality and effluent discharges. To develop data for the AMMTOX model, an in-stream water quality study should be conducted of the upstream receiving water conditions, particularly the pH and corresponding temperature, over a period of at least one year.

Due to the large dilution, very small WWTF discharge and very limited pH data (only one time sampling on 7/31/2006 was reported for Outfall 003A), the Division applied worst case scenario setpoints to this facility and used statistically-based, regionalized data for pH and temperature compiled from similar facilities and receiving waters.

The AMMTOX may be calibrated for a number of variables in addition to the data discussed above. The values used for the other variables in the model are listed below:

- Stream velocity = $0.3Q^{0.4d}$
- Default ammonia loss rate = 6/day
- pH amplitude was assumed to be medium
- Default times for pH maximum, temperature maximum, and time of day of occurrence
- pH rebound was set at the default value of 0.2 su per mile
- Temperature rebound was set at the default value of 0.7 degrees C per mile.

The results of the ammonia analyses for the Portland Plant WWTF are presented in Table A-8. Note that these values are for Outfall 003A. If the WWTF is discharged together with the WTP and stormwater from the Outfall 002A, the assimilative capacities in Table A-8 will get larger due to the dilutions from WTP and stormwater sources.

Table A-8

AMMTOX Results for the Arkansas River at the Portland Plant **WWTF**

Design of 0.15 MGD (0.23cfs) for 003A outfall

Month	*Total Ammonia Chronic (mg/l)*	*Total Ammonia Acute (mg/l)*
January	352	488
February	355	492
March	371	517
April	412	582
May	413	584
June	440	673
July	393	720
August	365	686
September	353	659
October	404	569
November	373	521
December	362	503

Agricultural Use Parameters (SAR and EC):

Section 31.11(1)(a)(iv) of *The Basic Standards and Methodologies for Surface Waters* (Regulation No. 31) includes the narrative standard that State surface waters shall be free of substances that are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life. The interpretation of these conditions (i.e., "no harm to plants" and "no harm to the beneficial uses") and how they were to be applied in permits were contemplated by the Division as part of an Agricultural Work Group, and culminated in the most recent policy entitled *Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops* (hereafter the Narrative Standards policy)

Based on available information, the water in **the Arkansas River** is used for irrigation water. However, due to the available dilution of 100:1 this facility is excluded from the agricultural use parameters based on policy WQP-24.

VII. Antidegradation Evaluation

The antidegradation process conducted as part of this water quality assessment is designed to determine if an antidegradation review is necessary and if necessary, to complete the required calculations to determine the limits that can be selected as the antidegradation-based effluent limit (ADBEL), absent further analyses that must be conducted by the facility.

As outlined in the *Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance* (AD Guidance), the first consideration of an antidegradation evaluation is to determine if new or increased impacts are expected to occur. This is determined by a comparison of the newly calculated WQBELs verses the existing permit limitations in place as of

September 30, 2000, and is described in more detail in the analysis. Note that the AD Guidance refers to the permit limitations as of September 30, 2000 as the existing limits.

If a new or increased impact is found to occur, then the next step of the antidegradation process is to go through the significance determination tests. These tests include: 1) bioaccumulative toxic pollutant test; 2) temporary impacts test; 3) dilution test (100:1 dilution at low flow) and; 4) a concentration test.

As the determination of new or increased impacts, and the bioaccumulative and concentration significance determination tests require more extensive calculations, the Division will begin the antidegradation evaluation with the dilution and temporary impact significance determination tests. These two significance tests may exempt a facility from further AD review without the additional calculations.

Note that the antidegradation requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard should be used. The appropriate standards are used in the following antidegradation analysis.

Significance Tests for Temporary Impacts and Dilution

The ratio of the chronic (30E3) low flow to the design flow for outfall **003A** is **626:1 (144:0.15)**, and is greater than the 100:1 significance criteria. Therefore there is no determination of significant degradation, and this outfall is exempted from the antidegradation evaluation based on the dilution significance test.

The ratio of the chronic (30E3) low flow available for outfalls **002A and 007A** to the design flows of 002A and 007A is **103:1 (144:1.4),** and is greater than the 100:1 significance criteria. Therefore there is no determination of significant degradation, and this facility is exempted from the antidegradation evaluation based on the dilution significance test.

VIII. Technology Based Limitations

Federal Effluent Limitation Guidelines

The federal guidelines that apply to this type of facility are found under 40 CFR 411, titled Effluent Guidelines for Cement manufacturing Point Sources. However, the section of the guidelines applicable to process waters were developed for facilities that discharge process water on a routine basis. In line with this, the Total Suspended Solids limitations for process water correlate to production rates.

This facility is dissimilar to those for which this guidance was developed. The facility is capable of completely recycling all process water and discharges would only occur in the event of a failure of a part of the recycle system. No water is generated during the manufacturing process; cooling water and WTP and WWTF effluent are consumed in the production of cement. For this reason, the Federal effluent guidelines that are correlated to production would not be appropriate and therefore

do not directly apply. State effluent limitations and water quality standards, described in other sections, will be applied to protect the receiving water from any isolated process water discharges from this facility.

Regulations for Effluent Limitations

Regulation No. 62, the Regulations for Effluent Limitations, includes effluent limitations that apply to all discharges of wastewater to State waters, with the exception of storm water and agricultural return flows. These regulations are applicable to the discharge from the proposed discharge.

According to Part 62.4(2) of the Regulations for Effluent Limitations "If the Commission has not so promulgated effluent limitation guidelines for any particular industry, but that industry is subject to effluent limitation guidelines promulgated by the United States Environmental Protection Agency pursuant to the Federal Water Pollution Control Act of 1972, the effluent from these industries shall be subject to the applicable EPA guidelines and shall not be subject to the effluent limitations of Regulation 62.4." Therefore, the limitation for oil and grease in Regulation 62.5 (10 mg/l) shall not apply to this discharge.

Table A-11 contains a summary of the applicable limitations for pollutants of concern at this facility.

Table A-11

Regulation 62 Based Limitations

Parameter	*30-Day Average*	*7-Day Average*	*Instantaneous Maximum*
BOD_5	30 mg/l	45 mg/l	NA
BOD_5 Percent Removal	85%	NA	NA
TSS, mechanical plant	30 mg/l	45 mg/l	NA
TSS, non-aerated lagoon	105 mg/l	160 mg/l	NA
TSS Percent Removal	85%	NA	NA
Total Residual Chlorine	NA	NA	0.5 mg/l
pH	NA	NA	6.0-9.0 s.u.
Oil and Grease	NA	NA	10 mg/l

XI. References

Regulations:

The Basic Standards and Methodologies for Surface Water, Regulation 31, Colorado Department Public Health and Environment, Water Quality Control Commission, effective November 30, 2009.

Classifications and Numeric Standards for Arkansas River Basin, Regulation No. 32, Colorado Department Public Health and Environment, Water Quality Control Commission, effective 6/30/2010

Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation 93, Colorado Department Public Health and Environment, Water Quality Control Commission, effective April 30, 2010.

Policy and Guidance Documents:

Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0, Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

Rationale for Classifications, Standards and Designations of Segments of the Arkansas River, Colorado Department Public Health and Environment, Water Quality Control Division, effective October 29, 2002.

Policy Concerning Escherichia coli versus Fecal Coliform, CDPHE, WQCD, July 20, 2005.

Colorado Mixing Zone Implementation Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, effective April 2002.

Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.

Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-24, effective March 10, 2008.

Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.